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## (54) BEDS

(71) I, JOHN REYNELL GIBBS, a British subject of Stone Cross House, Wadhurst, Sussex, England, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed to be particularly described in and by the following statement:—

10 The present invention relates to beds.

People who have to stay in bed for a prolonged period either in hospital or at home often suffer from bed sores as a result of lying in the same position for a prolonged period. The problem is particularly acute where the patient is unconscious or partly paralysed making it difficult for him to move himself. The normal procedure in hospital is for the nursing staff to turn the patient slightly, so that the weight of the patient is carried by a different part of the body. If the patient is severely incapacitated or particularly heavy this can be very hard work indeed, particularly as it needs to be done at frequent intervals, for example once every two hours, if bed sores are to be prevented.

It is now proposed, according to the invention, to provide a bed comprising a pair of elongate members, means for mounting said members so that their axes are substantially parallel, a net extending between said members and secured thereto and means for moving at least one of said members so that the portion of the net adjacent thereto moves generally parallel to itself, to effect a rolling motion of a patient supported on said net.

The effect of causing the portion of the net adjacent to one of the elongate members to move parallel to itself is to cause a movement of the net material immediately underneath the patient. It will be appreciated that the patient is lying in the net in a manner similar to a hammock during this

operation and that this causes a rolling or turning movement of the patient. Thus, by applying a relatively small force to the elongate member a patient can easily be turned. The mesh of the net is relatively wide, being sufficient to enable the elongate members which may be simply poles or tubes, to be threaded through the meshes of the net. By using such a net, for example, a nylon net, a number of advantages are achieved. Firstly, net material is slightly resilient which gives considerable comfort to the patient and, secondly, the patient can see through the net sideways, so that he does not feel so enclosed. An underblanket and a sheet may be placed over the central portion of the net and a pillow provided for the patient to have greater comfort.

The elongate member can be moved in a number of different ways. According to a first construction, the elongate member is lifted or lowered by any suitable means. This construction lends itself to self operation, since the lifting and lowering can be effected by winding a cord attached to the elongate member around a shaft mounted on an arrangement over the bed. The rotation of the shaft can be effected in a number of different ways. Thus, it can be effected by one or more electric motors, or it can be carried out by means of a hand lever which can be reciprocated back and forth in a form of pendulum motion to cause a pawl carried thereby to rotate a ratchet wheel. In another arrangement the rotation can be effected by a worm and pinion which itself is driven by a cord, such as a bead cord, passing over a pulley carried on the worm shaft. As indicated, any of these means enable the patient to operate the raising and lowering, and therefore the turning, himself.

In another arrangement according to the invention the net is made very wide and is wound up on the two elongate members.

Means are provided for rotating the two members about their own axes and for locking them in a particular rotational position. Thus, if the two members are rotated in opposite directions the patient is either raised or lowered and if the two members are rotated in the same direction the patient is turned.

Where the net is wound up on the elongate members, it is preferred to provide a line of pins on each elongate member over which the net material is hooked, and to hold it in place by a gutter shaped clamping bar which is held in place at each end by a hoop construction on the elongate member. The gutter shaped clamping member is preferably formed of a plastics material so that it is resilient and can be bowed to put it in place.

In order that the invention may more readily be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings, in which:—

Figure 1 is a perspective view of one embodiment of bed constructed in accordance with the present invention;

Figures 2 and 3 both illustrate further arrangements for lifting and lowering the support bar;

Figure 4 is a perspective view of a second embodiment of bed according to the invention;

Figure 5 is a fragmentary side elevation illustrating a method of securing the net material to the support bar of the construction of Figure 4; and

Figure 6 is a section taken along the line VI-VI of Figure 5.

Referring now to Figure 1, there is illustrated a bed having four uprights 10 each provided, as is conventional, with a wheel at the bottom, these uprights being arranged in the manner of a four poster bed at the foot and head of a bed and the uprights of a pair being spaced apart by cross members 11, 12 and 13 at each end. The longitudinal sides of the bed are made up by longitudinal bars 14 and 15 approximately at the height of a normal bed and at a height of about 2 and 6 feet respectively. A mattress (not shown) may be arranged between bars 14 in which case bars 12 and 14 would be at the same level. Extending approximately centrally from between the two bars 15 are a pair of supports 16 and 17 which carry two motors 18 and 19 each having a shaft 20 around which is wound a cord 21 which passes around two pulleys 22 and 23 and to the ends of which are secured an elongate member 24, for example in the form of a metal tube. At each of its ends, the member 24 has a plastics material, e.g. nylon or polytetrafluoroethylene, guide member 25 which is vertically slidable on

the adjacent upright 10. Extending between the two elongate members 24 is a net 26, formed for example of nylon netting, secured to the members 24 by the latter being threaded through alternate meshes about 2 inches from the margin.

In use, one of the motors 18 or 19 is operated, in the embodiment illustrated the motor 18 is operated, and the elongate member 24 is lowered to approximately the level of the bar 14. A patient can be placed in the bed and can lie on the net material. The motor 18 is then operated in the reverse sense and this causes lifting of the bar. The patient will get to a position where he is completely suspended in the net 26 in a manner similar to a hammock. In order to ensure more comfort one or more underblankets may be provided in the central portion of the net and a sheet and pillow if desired. When it is decided to turn the patient, the motor is operated thus causing a further lifting or lowering of one or both of the members 24. If the member 24 illustrated on the right in the drawing is lifted, then the net material will move under the patient from left to right as viewed in the drawing. This will cause the patient to tilt towards the other side thus giving a turning movement. A control switch for the motors can be positioned to enable the patient to control the movement himself.

Instead of having the motors, in the embodiment illustrated in Figure 2, the shafts 20 are provided with a ratchet wheel keyed or otherwise secured to the shaft and this can be caused to rotate by a lever arm 28 provided with a pawl (not shown). A suitable braking arrangement can also be associated with the handle 28. Thus reciprocation, in the manner of the movement of a pendulum, of the lever arm 28 will cause rotation of the shaft 20 to raise the associated elongate element 24. The patient can therefore lift himself. When he decides he wishes the bar to be lowered he can gently release the brake allowing his weight to unwind the cord from the shaft 20.

In the construction illustrated in Figure 3 in a schematic manner, the shaft 20 is driven by means of a pinion 29 secured thereon and in turn is driven by a worm 30 having a pulley 31 with a cord 32 therearound. This cord may be a continuous cord and is preferably of the bead cord type, the bead fitting in recesses in the pulley 31. Again pulling of the cord in the appropriate direction by the patient himself can cause raising or lowering. The advantage of using the worm is that it itself acts as a brake and the patient can simply operate the mechanism in one way or the other. Furthermore, if desired the worm and pinion can be used in cooperation with the motors 18 and 19 rather than having a direct drive or a reduction

gear drive to the shaft 20, the worm and pinion preventing undesired rotation of the shaft.

Referring to Figures 4, 5 and 6, a conventional hospital bed is shown having legs 40, cross-members 41 and longitudinal members 42, the bed fitted with a support arrangement 43 at its foot and with a further support arrangement 44 at its head.

The arrangement at the foot includes uprights 45 having a cross bar 47, the uprights having a double bend so that they are wider at the top than the bottom. The uprights 45 fit into a false leg 53 in the form of a tube which is held in place by an inverted U-shaped wire support hook bolted through the false leg and hooked around the leg of the bed. The cross-bar of the support 43 has two upwardly projecting bearing assemblies 49, one towards each side of the bed. Two pairs of rollers 50, 51 the roller 51 being higher than the roller 50, are mounted on the cross-bars 47 and on these bearing assemblies 49 respectively.

In each instance, the upright support members 45 are rotatable about their own axis and then can be clamped to the cross-bar 47, to adapt the support 43 to a particular bed.

A similar arrangement is provided for the support 44 except that here, instead of fitting into the false legs, the foot of the substantially vertical support members 52 are in fact engaged in sockets normally used for the head of the bed. Again a cross-bar 55 is provided, this consisting of two spaced apart strips bolted together to ensure that the uprights 52 are in the correct positions for the particular bed. The top pair of strips forming the cross-bar 55 have therebetween an arcuate piece of metal effectively forming a recess 56, one adjacent each end of the cross-bar 55. This provides a support for a nylon bearing 57, which is also illustrated in Figure 5, to which is secured a tubular elongate member 58. The other end of the tubular elongate member 58 is fixed between the pulleys 50 and 51, so that the two members 58 extend substantially parallel to one another.

As illustrated in more detail in Figures 5 and 6, the elongate members are in the form of tubes having diametrically extending pins 59 welded at 60 to the outer surface of the elongate member 58 and projecting approximately one eighth of an inch beyond the opposite sides. The pins are spaced apart in a straight line at about one and a half inch intervals. Along the length of the elongate member are disposed a number of hoops, preferably four hoops, 61 which are secured as illustrated in Figure 6. An arcuate member in the form of a gutter shaped clamping bar 62 extends along the bar a distance slightly greater than the

distance between the nearest edges of two adjacent hoops. The spacing of the hoops is such that all the members 62 can be of the same length.

A nylon net 63 similar to that used in Figure 1 is held in place by hooking over the projecting portions of the pin 59 and by the clamping bars being bowed and slipped under the hoops 61 before springing back into position.

At the ends adjacent the rollers 50, 51, i.e. at the foot end of the bed, a handle is provided on each elongate member, this handle including two spaced apart strips 70 pivoted about a pivot pin 71 perpendicular to the axis of the elongate member 58. Parallel to the elongate members 58, and at the other end of the strip 71, are handle grips 72 similar to a conventional car starting handle. The upper cross-bar 47 is provided with two lugs 73 each having an up-turned end portion, so positioned as to be able to engage the strips 70 and the latter are in a plane passing through the pivot 71 and perpendicular to the axis of the elongate member 58.

A marker, e.g. a ribbon, is positioned approximately at the centre of the net. In this instance the net is approximately 12 feet from side to side and 9 feet from head to foot.

Two hooking arrangements 74 are provided one on each leg on each side of the bed.

In use, the elongate member 58 illustrated on the right in the drawing is placed on the hook 74 and the patient once again is put onto the bed. The elongate member 50 is then lifted and placed in the position illustrated. Then, by rotating the two elongate members, by means of a handle, which are pulled forwardly to clear the lugs, so that the elongate members rotate in opposite directions, the net is wound up to lift the patient clear of the bed mattress. The patient can remain in this manner until he requires turning. Turning can simply be effected by rotation of the two handles in the same direction which moves the net beneath the patient. The patient then is caused to roll or be turned. With this arrangement it is readily possible to turn the patient completely over from one side to the other or from his back onto his face. The marker ribbon is provided to ensure that after a number of uses the net is approximately centrally disposed on the two elongate members. Again, with this construction, the net can be covered with blankets and a sheet and a pillow in the centre.

Although it has not been shown, the rotation of the elongate members could again be effected by other means, e.g. by a motor or by a pulley arrangement which could be operated by the patient himself.

## WHAT I CLAIM IS:—

1. A bed comprising a pair of elongate members, means for mounting said members so that their axes are substantially parallel, a net extending between said members and secured thereto and means for moving at least one of said members so that the portion of the net adjacent thereto moves generally parallel to itself, to effect a rolling motion of a patient supported on said net.

2. A bed according to claim 1, wherein the means for moving said at least one member comprise means for raising and lowering said at least one member.

3. A bed according to claim 2, wherein the means for raising and lowering said at least one member comprises at least one rotatable shaft, a cord wound around said shaft and attached to said member, and means for rotating said shaft.

4. A bed according to claim 3, wherein said means for rotating said shaft comprise at least one electric motor.

5. A bed according to claim 3, wherein said means for rotating said shaft comprise a ratchet on said shaft, a hand lever pivotally mounted on said shaft and a pawl engageable with said ratchet and operable by reciprocal pivoting movement of said hand lever to rotate said shaft.

6. A bed according to claim 3, wherein said means for rotating said shaft comprise a pinion on said shaft, a worm engageable therewith, a pulley for rotating said worm and a cord for rotating the pulley.

7. A bed according to claim 6, wherein the cord is a bead cord.

8. A bed according to any one of claims 2 to 6, wherein vertically extending guide bars are engageable by a guide element on each end of said at least one member, the guide elements being slidable on said guide bars.

9. A bed according to any one of claims 2 to 8, wherein said elongate members are threaded through edge portions of said net material.

10. A bed according to claim 1, wherein the means for moving said at least one member comprise means for rotating said at least one member about its axis.

11. A bed comprising a pair of elongate members, means for mounting said members so that their axes are substantially parallel, a net extending between said members and secured thereto, so that the net may be wound up on both the said members,

means for rotating said members about their axes and means for locking the members against rotation.

12. A bed according to claim 11, wherein said mounting means comprise two supports, one at the foot end and one at the head end.

13. A bed according to claim 12, and including a substantially rectangular frame having laterally spaced apart recesses in one end portion, and a bearing disc carried on one end of each of said elongate members, said bearing discs each being positionable in one of said recesses, each elongate member being supported at the other end, so that the elongate members extend substantially parallel to one another.

14. A bed according to claim 13, wherein the means for rotating the members comprise a handle pivotally mounted about an axis perpendicular to the axis of the associated elongate member adjacent to the other end of each member.

15. A bed according to claim 14, wherein the locking means comprise lugs on said other end portions, engageable by said handle when the latter are in a plane passing through their pivots and substantially perpendicular to the axes of the elongate members.

16. A bed according to any one of claims 10 to 15, wherein there is provided, on each elongate member, a plurality of radially outwardly projecting pins arranged in a line parallel to the axis of the elongate member, hoop portions connected to said elongate members and curved cross-section locking bars securable under said hoops to retain the net material in position on said pins.

17. A bed substantially as hereinbefore described with reference to and as illustrated in Figure 1 of the accompanying drawings.

18. A bed according to claim 17 modified substantially as hereinbefore described with reference to and as illustrated in Figure 2 or Figure 3 of the accompanying drawings.

19. A bed substantially as hereinbefore described with reference to and as illustrated in Figures 4, 5 and 6 of the accompanying drawings.

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